

PROGRAM RESEARCH & DEVELOPMENT ANNOUNCEMENT

NR. 01-15-SNK

‘ADVANCED THREAT ALERT AND RESPONSE (ATAR)’

TABLE OF CONTENTS

Announcement

***a.* Introduction**

Section A: Statement of Problem/Objective

Section B: Award Information

Section C: Proposal Preparation Instructions

Section D: Basis for Award

Section E: Other Information to Offerors

**CBD ANNOUNCEMENT NR: Program Research and Development Announcement (PRDA)
NR 01-15-SNK**

TITLE: ADVANCED THREAT ALERT AND RESPONSE (ATAR)

TECHNICAL POC: P. Aaron Linn, AFRL/SNZW, phone (937) 255-5900 ext 4279, telefax (937) 255-255-7984, email: aaron.linn@wpafb.af.mil, Mail address: AFRL/SNZW, 2241 Avionics Circle, Room N1A12, Wright-Patterson AFB OH 45433-7303

CONTRACTING POC: Dawn Ross, AFRL/SNKD, phone: (937) 255-5186, telefax (937) 656-9074, email: dawn.ross@wpafb.af.mil, Mail address: AFRL/SNKD, Bldg 167, 2310 8th St., Wright-Patterson AFB, OH 45433-7310 or Rick Chance, Contracting Officer, AFRL/SNKD, phone: (937) 255-3585, telefax (937) 656-9074, email: richard.chance@wpafb.af.mil, Mail Address: AFRL/SNKD, Bldg 167, 2310 8th St, Wright-Patterson AFB OH 45433-7310.

PROPOSAL DUE DATE AND TIME: 22 JUN 01, 4:00 P.M. local time. *NOTE: Proposal receipt after the due date and time shall be governed by the provisions of FAR 52.215-1(c)(3).*

INTRODUCTION:

The Air Force Research Laboratory, Sensors Directorate, (AFRL/SNKD), Wright Research Site is soliciting technical and cost proposals on the research effort described in Section A below and as supplemented by the Advanced Threat Alert and Response (ATAR) Program Information Package (PIP) that is available separately from the contracting point of contact (POC) stated above. All offerors will submit in writing their request for a copy of the PIP. The PIP package contains information classified up to SECRET. All written requests must contain the complete address of the cleared facility where the classified package can be sent. Facsimiles and e-mail requests will be accepted. The PIP contains: (1) ATAR Preliminary Requirements Study (Secret); (2) Precision Location and Identification (PLAID) Final Report (SECRET); (3) Advanced Tactical Targeting Technology (AT3) Phase 1 draft final reports (SECRET); (4) White papers for the AFRL/SNZW Integrated Demonstrations and Applications Laboratory (IDAL) and AFRL/SNDD & AFRL/SNDM facilities. Proposals should be addressed to the Contracting Point of Contact (POC) stated above. This is an unrestricted solicitation. Small businesses are encouraged to propose on all or any part of this solicitation. Proposals submitted shall be in accordance with this announcement. *There will be no other solicitation issued in regard to this requirement.* Offerors should be alert for any PRDA/BAA amendments that may permit extensions to the proposal submission date.

Potential offerors are notified that effective 01 Jun 1998, in order to be eligible to receive any DOD award, contractors must be registered in the Central Contractor Registration (CCR) Database, unless a contractor meets any of the exceptions of DFARS 204.7302. On-line registration instructions can be accessed from the Wright Research Site Contracting Office home page at <http://www.wrs.afrl.af.mil/contract/> or the DISA CCR home page at <http://www.ccr2000.com/>.

SECTION A: Statement of Problem/Objective:

1. Statement of Objective/Needs:

(A) BACKGROUND

The three main drivers of Electronic Support Measures (ESM) systems are the Radio Frequency (RF) environment; the limited capability of fielded Radar Warning Receivers (RWR); and new warfighter needs. The evolution of the RF environment through the proliferation of Low Probability of Intercept (LPI), mobile, upgraded, & multifunction radars will necessitate enhanced intercept, detection, identification (type and Specific Emitter ID (SEI)) and location capabilities for ESM systems.

Technology improvements will be employed on all Surface to Air Missile (SAM), Anti-Aircraft Artillery (AAA) and airborne radars. As threat radar search, acquisition, target and missile guidance timelines shorten and new tactics are developed, current systems on combat aircraft will become less effective. The increasingly complex radar signals environment will drive receivers to larger instantaneous acquisition and processing bandwidths, higher sensitivity, significantly improved processing throughput, adaptable and optimized digital signal processing techniques and improved parametric resolution. The majority of fielded RWRs, including the ALR-56C and ALR-56M, are 1970s vintage systems with limited reprogrammability and little capability against modern threats and other advanced emitters. These broadband receivers use specialized devices produced in relatively low volumes at a premium cost to the military customer and are subject to severe parts obsolescence. The analog receivers are bulky and possess parameters, which drift with time and environmental conditions. Small, stable, highly reliable, easily maintainable and low cost replacements of current inventory RF receivers are required. Warfighter requirements dictate that the receiver architecture be readily reprogrammable for new threats and optimized for every platform according to mission type and stage of mission in order to maximize airspace buyback. This modular approach to retrofitting receivers will permit the utilization of the core receiver design on tactical, strategic, transport and theater assets with minimal development and production cost. Ultimately the receiver will form the baseline for all future digital radar warning and targeting receivers for existing and future aircraft and Unmanned Aerial Vehicles (UAVs) and become the heart of an advanced digital EW countermeasure system. As the driver for the countermeasures techniques generator, the system must reliably and quickly provide high quality pulse level threat signal data. Airborne emitter location will provide invaluable bearing, range, closing and opening information to the aircrew. ID and location of lowband radars will be required to counter new Integrated Air Defense (IADS) tactics. Advanced processing techniques are required to perform multi-spectral data fusion on-board the platform. This capability will permit processing and fusion of other warning sensor data, e.g., missile warning system, at the digital RF receiver by coupling the additional sensor's digital data into the processor. In summary, the ATAR capability will enable high confidence, precision situational awareness (SA), airspace buyback, targeting, increased aircraft survivability, electronic order of battle (EOB) collection and battle damage assessment (BDA).

(B) OBJECTIVES

The objective of the ATAR Critical Experiment is to develop an affordable, multi-spectral warning, Situational Awareness (SA), RF targeting and RF countermeasures system architecture. The Baseline program is divided into Analysis, Modeling and Simulation and Laboratory Demonstration tasks. Innovative multi-spectral architectures and algorithms are sought to increase the survivability of combat aircraft against advanced, integrated radio frequency, and infrared air defense systems. The multi-spectral system architecture capability will be verified by simulation and/or analytical methods. The laboratory demonstration system will consist only of the RF receiver, an Off the Shelf (OTS) techniques generator and antennas. The RF receiver will be capable of simultaneous, real-time, enhanced detection, identification, location, and jamming response, to multiple advanced radars at stand-off ranges. Receiver capability against LPI radars, radars with advanced antenna arrays, multifunction/mobile radars, and pulse dense environments (to include relevant commercial emitters) must also be provided. The receiver is expected to execute all warning, SA and targeting dwells within a severe jamming look-through schedule. The targeting approach will incorporate single and multi-ship techniques. The ATAR system will be retrofittable and transitionable to multiple current and future combat and support aircraft with RWRs, ESM, Electronic Countermeasures (ECM), or Electronic Intelligence (ELINT) systems and operate as the core of advanced digital Electronic Warfare (EW) response systems. The modular and readily reprogrammable digital receiver/response system will be modifiable for performance optimization as required by the aircraft mission. The implementation will stress small size, affordable aircraft kit cost, high reliability, and ease of maintenance for a significant reduction in life cycle cost. The system will include robust advanced signal processing algorithms for improved intercept, detection, sensitivity, processing gain, parameter encoding, deinterleaving, identification and location of complex / LPI signals in dense environments. In addition, hardware factors such as broadband, low noise/distortion digital downconverter assemblies (DDCAs), analog to digital converters (ADCs) with large instantaneous bandwidth and dynamic range, and dual polarization apertures with a wide field-of-view and monopulse direction finding (DF) capability must be considered. The demonstration system will also include a digital RF memory (DRFM) based EW techniques generator. The ATAR critical

experiment will feed the Advanced Threat Alert Advanced Technology Demonstration, which in turn will support a 2008 EMD program.

1) Analysis, Modeling and Simulation Tasks:

Analysis and modeling of the system components; RF receiver, ECM techniques generator, missile warning systems and apertures is required to determine performance improvements and optimal architecture. Emphasis will be placed on the RF receiver architecture analysis. A detailed plan is required that defines the methodology, technical approach, work tasks and schedule for accomplishing the analysis, modeling and simulation tasks. The following RF receiver performance requirements and components/techniques will be considered simultaneously in the design process to maximize performance and minimize cost:

- i)** Wide instantaneous acquisition and processing bandwidths are required to detect LPI (low duty cycle/single pulse, narrow pulse/spread spectrum waveforms and frequency hoppers) emitters to achieve high probability of intercept for all warning dwells, SA dwells and targeting dwells in a dense RF signal environment within a tactical aircraft timeline.
- ii)** Innovative dwell schedules techniques are needed for optimal/high probability of emitter intercept dependent upon mission, stage of mission and theater. The real-time configurable dwell schedule is required for optimum intercept of LPI emitters and to accommodate all warning, SA, targeting & techniques generator requirements relative to RF environment (IADS script, theater pre & real time mission intelligence updates), look through & EMI onboard emitter and commercial emitter interference requirements.
- iii)** Conversion technologies and advanced signal processing techniques for improved time, frequency, amplitude and phase resolution and accuracy will be incorporated.
- iv)** Robust detection and processing techniques will be employed to improve processing gain, sensitivity, detection, encoding and deinterleaving of complex /LPI signals (side and back lobes as required) in dense environments is required.
- v)** The system must possess low latency and high throughput capability for simultaneous, real-time intercept, detection, type ID and SEI and location of multiple advanced radars at standoff ranges.
- vi)** Detection of intentional/unintentional modulations on a pulse to include phase, frequency and amplitude is required.
- vii)** Development of airborne and low band emitter passive location techniques is necessary for improved SA.
- viii)** Low cost and improved maintainability will be achieved through reduced system complexity/component count and integration of antenna, RF distribution/conversion, encoding, receiver and processing functions in a single LRU. Affordability will be achieved through FPGAs, ASICs, COTS and component integration.
- ix)** It is anticipated that the receiver meet the existing radar warning receiver's size, weight and prime power requirements for a single LRU.

2) Laboratory Demonstration Tasks:

The laboratory demonstration system will consist of a state of the art brassboard digital receiver for RF threat alert, precision situational awareness, and passive targeting and an OTS RF countermeasures techniques generator and OTS RF apertures. The majority of the effort will be focused on the development of the receiver architecture, control and processing. The demonstration system frequency range will cover the traditional 2-18 GHz bands and extend

down into early warning radar range for complete coverage. Incremental demonstrations of the system components in the AFRL/SN Integrated Demonstrations and Applications Laboratory (IDAL) are required to evolve/verify/demonstrate performance improvements and architecture feasibility. The AFRL/SN IDAL facilities/expertise are available as Government Furnished Equipment (GFE). IDAL will provide the high-fidelity man/hardware-in-the-loop synthetic battlespace RF sensor technology testbed to evolve, integrate and demonstrate the ATAR technologies, system components and system. These incremental demonstrations will be conducted through a building block integration methodology starting with the basic receiver/processor threat identification functions proceeding to the threat emitter location processing technologies. It is anticipated that contractor laboratory research will utilize government supplied high accuracy modulation on pulse parameter simulators for evolving the intercept, detection, deinterleaving, type and SEI ID functions. A detailed Technology Development and Demonstration Plan is required that defines the research methodology, demonstration approach/scenarios, research tasks and schedule for developing, evolving, and demonstrating the ATAR technologies, system components and system. The plan must identify the critical ADAR performance requirements including the demonstration/evaluation methodologies for verifying the requirements. The demonstrations will consist of the following:

- i)** The demonstration will include a digital receiver architecture which supports warning, SA, targeting & ECM techniques generator feed. The digital receiver will provide a high sensitivity, wide dynamic range and broad instantaneous bandwidth for a high probability of intercept capability. Demonstration of the receiver sensitivity, detection, encoding, deinterleaving, identification and location of advanced radars employing lower ERP, complex waveforms, frequency/PW/PRI/polarization agility, bistatic/monostatic and/or LPI techniques is required. The demonstration of parameter encoding beyond “classical” parameters (amplitude, frequency, PW, PRI, etc.), to include MOP, improved TOA and frequency, is expected.
- ii)** The system will include a DRFM based ECM techniques generator capable of generating advanced techniques to counter current and future threats including RF missiles and search, acquisition, tracking and missile guidance radars. The demonstration will prove the OTS techniques generator selected the correct jamming technique. The EW response system will be queued by the digital receiver and all techniques will be generated digitally prior to digital to analog (D/A) and RF up conversion.
- iii)** The receiving system will take inputs from existing antennas or from form fit, dual polarization, multi-element / multi-octave apertures. Demonstration of enhanced system detection, location, and identification capability utilizing OTS antenna technology is required.
- iv)** The RF component development effort is a parallel development, which will define and potentially develop a state-of-the-art prototype RF component. The contractor will support the trade study and component demonstration in conjunction with the RF Components Team from AFRL/SND. In the trade study effort, the contractor will work with AFRL/SND to identify a specific, critical RF component for the digital receiver, such as a low noise amplifier, mixer, filter or switch. The contractor will define component specifications based on system requirements and in cooperation with AFRL/SND refine the component specifications required for the laboratory demonstration. AFRL/SND will assist with identifying device technologies to optimize the intended component performance. Once the components and design goals have been identified, AFRL/SND will, if feasible, fabricate the component and prove the prototype’s capabilities in a component-level demonstration. If available, the components will be utilized in the IDAL laboratory system breadboard demonstration to verify anticipated performance improvements. The AFRL/SND laboratory facilities and expertise are available as Government Furnished Equipment (GFE).

v) Working in cooperation with AFRL/SN's Digital Receivers and Exciters Sub-thrust, the contractor will define an improved analog to digital conversion component requirements and technology and for improved sampling rate, frequency/bandwidth, amplitude and phase resolution and accuracy. Depending on the ADC availability (from AFRL/SN's Digital Receivers and Exciters Sub-thrust), demonstrate novel ADC architectures and improvement over commercially available products in the IDAL laboratory system brassboard demonstration or under individual ADC component testing in the Digital Receiver Prototype Laboratory. These AFRL/SN's Digital Receivers and Exciters Sub-thrust laboratory facilities and expertise are available as Government Furnished Equipment (GFE) depending on availability.

3) Option 1: The option will demonstrate enhanced multi-spectral threat warning through the use of RF and Infrared (IR) source data fusion algorithms. Fusion of the RF and IR data will improve combat ID, situational awareness (threat warning) and assessment (threat intent). It is anticipated that IR sensors data will be processed in the ATAR system and will utilize RF cueing for IR event detection and Rules of Engagement/Doctrine Indication. The IDAL laboratory demonstration will prove the utility of fusing RF and IR data for improving the system warning function. The expected funding for this effort is \$500,000.

4) Option 2: Currently, RF signals are routed throughout airframes incurring signal loss resulting in decreased sensitivity. This option will develop architecture and products that convert signals to digital representation closer to the aperture, possibly at the aperture, and will use the existing cables for prime power and digital data without loss in signal sensitivity. The IDAL laboratory demonstration will prove the sensitivity improvement for the ESM system. The expected funding for this effort is \$500,000.

2. Schedule:

a. Overall effort– Overall effort is 40 months of technical plus four months for the completion and submission of the final report. Between tasks the period of performance is as follows:

- Analysis, Modeling and Simulation Task: 24 months
- Laboratory Demonstration Task: 30 months (includes 24 months for technical effort and 4 months for Final Report and overlaps with the analysis, modeling, and simulation tasks)
- Option 1: 24 months (within baseline timeline)
- Option 2: 24 months (within baseline timeline)

b. Data Items: Data Items will be required to be delivered as per the Contract Data Requirements List (CDRLs). Status Report, DI-MGM-80368/T, Contract Funds Status Report, DI-MGM-81468/T, Funds and Man-Hour Expenditure Report, DI-MGM-80331/T, Scientific and Technical Reports (Contractor's Billing Voucher), DI-MGM-80711A/T, Project Planning Chart, DI-MGM-80507A/T, Contract Work Breakdown Structure, DI-MGM-81334/T, Presentation Material, DI-MGM-81373/T, Conference Minutes, DI-MGM-81250A/T, Computer Software Product End Items, DI-MGM-80700/T, Software Test Plan, DI-MGM-81438A/T, Software Design Description, DI-MGM-81435A/T, Software Test Report, DI-MGM-81440A/T, Scientific and Technical Reports (Final Report), DI-MGM-80711A/T, Interface Requirements Specification (IRS), DI-IPSC-81436A/T, Interface Design Description (IDD), DI-IPSC-81434A/T.

c. Software and Hardware: All software and hardware items developed and purchased on the ATAR program shall be delivered to the Government, with unlimited rights, upon completion of the program.

3. Other Requirements

a. SECURITY: It is anticipated that work performed under this effort will require access to data and information that is classified up to and including the SECRET level. The contractor must possess the personnel and facilities to support this level of classification.

b. TEMPEST: Generation of classified material for this solicitation is authorized only on equipment approved for classified processing by Air Force TEMPEST authorities

c. International Traffic in Arms Regulations (ITAR) (export control) applies. Offerors must submit a DD Form 2345, Export-Controlled DOD Technical Data Agreement with their proposal.

d. PL 98-94 (export control) applies.

e. GOVERNMENT FURNISHED PROPERTY/INFORMATION (GFP/I) AND BASE SUPPORT: The Government will provide the ATAR Preliminary Requirements Study, PLAID Final Report, and AT3 Phase 1 draft final reports. Base support will be made available for offeror's proposing the use of the AFRL/SN IDAL laboratory facilities and expertise and the AFRL/SN's Digital Receivers and Exciters Sub-thrust laboratory facilities and expertise. Availability of base support is dependent on scheduling.

SECTION B: Award Information

1. EXPECTED AWARD DATE: 25 Sep 01.

2. CONTRACTS AWARDED: While a single award is anticipated, the Air Force reserves the right to make multiple awards and may select for award all, part or none of the proposals received.

3. GOVERNMENT FUNDING ESTIMATE: The total funding available for the program is \$3,900,000. The funding is allocated throughout the following fiscal years: FY01, \$109,000; FY02, \$700,000; FY03, \$1,420,000; FY04, \$1,671,000. This funding profile is an estimate only and is not a promise for funding as all funding is subject to change due to Government discretion and availability.

4. TYPE OF CONTRACT/INSTRUMENT: Cost Plus Fixed Fee, Cost (no fee) or assistants instruments. See [Section D](#) below.

SECTION C: Proposal Preparation Instructions

1. General Instructions:

a. Offerors should apply the restrictive notice prescribed in the provision of FAR 52.215-1(e) Instructions to Offerors--Competitive Acquisition. Proposal questions should be directed to the contracting point of contact listed above. Offerors should consider proposal instructions contained in the AFRL [PRDA/BAA Guide for Industry](#), which can be accessed on line at www.wrs.af.mil/contract. This guide was specifically designed to assist offerors in understanding the PRDA/BAA proposal process. Technical/management and cost volumes should be submitted in separate volumes, and must be valid for 180 days. Proposals must reference the above announcement number. Offerors must submit one original and five (5) copies of their proposals. ***Offerors are advised that only contracting officers are legally authorized to contractually bind or otherwise commit the government.*** [The cost of preparing proposals in response to this PRDA is not considered an allowable direct charge to any resulting or any other contract; however, it may be an allowable expense to the normal bid and proposal indirect cost as specified in FAR 31.205-18.](#)

b. Notice to Foreign-Owned Firms: Foreign contractors are not permitted to participate in this procurement at the prime contractor level. This acquisition involves data that are subject to export

control laws and regulations. Only contractors who are registered and certified with the Defense Logistics Services Center (DLSC) and have a legitimate business purpose may participate in this solicitation. Contact the Defense Logistics Services Center, 74 Washington Avenue N., Battle Creek, Michigan 40917-3084 (1-800-352-3572) for further information on the certification process. You must submit a copy of your approved DD Form 2345, Military Critical Technical Data Agreement, with your proposal.

1. Technical/Management Proposal:

- a. Page Limitation: 50 pages, 12 point or larger, double spaced, single-sided, 8.5 by 11 inches. This limitation includes all information, e.g., indices, photographs, appendices, attachments, etc. (no foldouts). It does not apply to the offeror's proposed Statement of Work (SOW), Table of Contents, cover page and resumes. The government will not consider pages in excess of this limitation. It is also required that the offerors submit the technical proposal on PC media in the Microsoft Word 97 format.
- b. Proposals may contain information up to and including SECRET. The proposal shall include a discussion of the nature and scope of the research and the technical approach. Additional information on prior work in this area, descriptions of available equipment, data and facilities should also be included as attachments to the technical proposal. This volume shall include a SOW detailing the technical tasks proposed to be accomplished under the proposed effort and suitable for contract incorporation. *Do not include any proprietary information in the SOW.* Refer to the [AFRL PRDA/BAA Guide for Industry](#) referenced above to assist in SOW preparation.
- c. Any questions concerning the technical proposal or SOW preparation shall be referred to the Technical POC cited above.

2. Cost/Business Proposal:

- a. Separate the proposal into a business section and cost section. *Adequate price competition is anticipated.* The business section should contain all business aspects to the proposed contractual or instrument arrangements, such as type of contract/instrument, any exceptions to terms and conditions of this announcement, any information not technically related, etc. Provide rationale for exceptions. All offerors (unless exempt) shall submit a subcontracting plan along with their proposal, including a copy of the prime's analysis accomplished for each subcontractor proposed. The Cost proposals have no limitations; however, offerors are requested to keep cost proposals to 25 pages as a goal. The proposal shall include supporting schedules and shall be broken down by cost element to include personhours (include hours and rate by labor category), materials (include any backup documentation such as vendor quotes, catalog prices, engineering estimates, etc); indirect rates, travel (include the purpose, length of trip, and number of people traveling per trip), and any other direct costs associated with this effort. **The costs shall be broken out between the baseline effort, Option 1 and Option 2; by task and by calendar year.** Refer to the [AFRL PRDA/BAA Guide for Industry](#) for detailed proposal instructions.

SECTION D: Basis for Award

A single award is anticipated and will be based on an evaluation of each offeror's proposal (both technical and cost/price aspects) to determine the overall merit of the proposal in response to the announcement. The technical aspect, which is ranked as the first order of priority, shall be evaluated based on the following criteria that are of **descending** importance:

TECHNICAL:

- a. New and creative solutions
- b. Offeror's understanding of problem and scope of the technical effort
- c. Soundness of offeror's technical and management approach, including teaming.
- d. Corporate experience, facilities, and availability of qualified experienced technical personnel, in addition to experience in areas such as signal processing, data analysis of flight data and simulation.
- e. Organization, clarity and thoroughness of the proposed SOW.

COST/PRICE: Cost/Price includes the reasonableness and realism of the proposed cost and fee and consideration of proposed budgets and funding profiles. Cost/Price is a substantial factor, but ranked as the second order of priority.

Proposal Risk Assessment: Proposal risk will be individually assessed for the technical, cost and schedule areas. Proposal risk relates to the identification and assessment of the risks associated with an offeror's proposed approach as it relates to accomplishing the proposed effort. Tradeoffs of the assessed risk will be weighed against the potential payoff.

No other evaluation criteria will be used. The technical and cost proposals will be evaluated at the same time. The Air Force reserves the right to select for award of a contract, any, all, part or none of the proposal received. The government also reserves the right to award any resulting contract pursuant to the Research and Development Standard Contract format in DFARS 235.70.

SECTION E: OTHER INFORMATION TO OFFERORS:

1. An Ombudsman has been appointed to hear concerns from offerors or potential offerors during the proposal development phase of this acquisition. The purpose of the Ombudsman is not to diminish the authority of the program director or Contracting Officer, but to communicate Contractor concerns, issues, disagreements, and recommendations to the appropriate government personnel. When requested, the Ombudsman shall maintain strict confidentiality as to the source of the concern. The Ombudsman does not participate in the evaluation of proposals or in the selection decision. Interested parties are invited to contact Lt. Col. Sam A. Lopez, AFRL/PK, telephone (937) 255-4813, e-mail sam.lopez@wpafb.af.mil . All routine communication concerning this acquisition should be directed to Dawn Ross, Contract Negotiator, telephone (937) 255-5186.

2. Based upon market research, the Government is not using the policies contained in Part 12, Acquisition of Commercial Items, in its solicitation for the described supplies or services. However, interested persons may identify to the contracting officer their interest and capability to satisfy the Government's requirement with a commercial item within 15 days of this notice.